

SALMONELLA ENTERITIDIS

What is a *Salmonella* Enteritidis (SE) Infection?

Salmonella Enteritidis (SE) is one of the two most common types of *Salmonella* reported in the United States and in California. In the mid 1980s, an epidemic of SE infections, due to contaminated eggs emerged in the northeastern United States and then, over the next decade, spread to the south and west. The outbreak of SE infections associated with eggs reached California in the mid 1990s.

SE can be inside normal appearing eggs and, if the eggs are eaten raw or undercooked, the bacterium can cause illness. This egg-associated problem has decreased significantly in California and recent outbreaks have been due to other vehicles such as raw almonds, unpasteurized orange juice, and raw mung bean sprouts.

From 1994 through 1996, more than 2,000 SE infections were identified each year in California. And, between 1994 and 1999, 12-18 SE outbreaks were identified each year; the vast majority of these outbreaks were due to undercooked eggs and egg dishes. Then, in 2001-2003, the number of SE infections in California decreased to 600 to 750 infections each year and the number of SE outbreaks decreased to 1 to 3 per year.

A person infected with the SE bacterium usually has fever, abdominal cramps, and diarrhea beginning 12 hours to a week after consuming a contaminated food or beverage. The illness usually lasts 4 to 7 days, and most persons recover without antibiotic treatment. However, the diarrhea can be severe, and occasionally persons with blood stream infection may require hospitalization.

The elderly, infants, and those with a weakened immune system may have a more severe illness. In these patients, the infection may spread from the intestines to the blood stream and then to other body sites, and can cause death unless treated promptly with antibiotics.

How do eggs become contaminated?

Most types of *Salmonella* live in the intestinal tracts of animals and birds and are transmitted to humans by contaminated foods of animal origin. Stringent procedures for cleaning and inspecting eggs were implemented in the 1970s and have made salmonellosis caused by external fecal contamination of eggshells extremely rare. However, in recent times, SE outbreaks have also followed ingestion of clean, intact, grade A eggs. The reason is that SE can silently infect the ovaries of healthy-appearing hens and contaminate egg contents before shells are formed.

Only a small number of hens seem to be infected with SE at any given time, and an infected hen can lay many normal eggs and only occasionally lay an egg contaminated with the *Salmonella* bacterium before returning to lay normal, uninfected eggs.

Who can be infected?

Anybody can get infected, but the elderly, infants, and persons with a weakened immune systems are at increased risk for serious illness. In these persons, even a relatively small number of *Salmonella* bacteria can cause severe illness. Most of the deaths caused by SE infections have occurred among the elderly in nursing homes. Egg-containing dishes prepared for high-risk persons anywhere, but especially in hospitals, in nursing homes, and in child care centers, should be prepared with pasteurized eggs.

What is the risk?

In affected parts of the United States, about one in 50 average consumers is probably exposed to a contaminated egg each year. If that egg is thoroughly cooked or pasteurized, the *Salmonella* organisms will be destroyed and will not make the person sick. Many dishes made in restaurants or commercial or institutional kitchens, however, are made from pooled eggs. If 500 eggs are pooled, one batch in 20 could be contaminated and everyone who eats undercooked eggs from that batch could be at risk. A healthy person's risk for infection by SE is low if individually prepared eggs are properly cooked or foods are made from pasteurized eggs.

What you can do to reduce your risk of egg-associated SE infection

Eggs, like meat, poultry, milk, and other foods, should be handled properly. Shell eggs are safest when they are stored in the refrigerator, then thoroughly cooked, and promptly consumed. The larger the number of *Salmonella* organisms present in the egg, the more likely it is to cause illness. Keeping eggs adequately refrigerated prevents any *Salmonella* present in the eggs from growing to greater numbers, so eggs should be held refrigerated until they are needed. By California law, raw shell eggs must be kept refrigerated by commercial establishments (e.g., grocery stores and restaurants). Cooking reduces the number of bacteria present in an egg; however, an egg with a runny yolk still poses a greater risk than does a completely cooked egg. Undercooked egg whites and yolks have been associated with outbreaks of SE infections.

How you can reduce the risk of *Salmonella enteritidis* infection:

- Keep eggs refrigerated.
- Discard cracked or dirty eggs.
- Wash hands and cooking utensils with soap and warm water after contact with raw eggs.
- Eat eggs promptly after cooking. Do not keep eggs warm for more than 2 hours.

- Refrigerate leftover egg-containing foods.
- Avoid eating raw eggs (as in homemade ice cream or eggnog that contains raw eggs).
- Avoid restaurant dishes made with raw (unpasteurized) eggs that are not cooked. Restaurants should use pasteurized eggs in any recipe (such as Hollandaise sauce or Caesar salad dressing) that calls for pooling of a large number of eggs.
- Use pasteurized eggs when preparing egg dishes for populations at risk of severe complications from salmonellosis. Nursing homes, retirement communities, child care centers, and hospitals should use pasteurized eggs rather than raw shell eggs.
- Avoid raw almonds, unpasteurized juices, and raw mung bean sprouts (in fact, avoid any raw sprouts) and do not serve these items to populations at risk of severe complications from salmonellosis.

What else is being done?

Government agencies and the egg industry have taken steps to reduce egg-associated SE outbreaks. These steps include identifying and removing infected chicken flocks from the egg supply and assuring quality and sanitation. In California, the California Egg Quality Assurance Program was started in 1994; 98% of egg ranches and producers are now part of this program. Adherence to this program has helped promote the recent control of the egg-associated SE infection problem in California.